



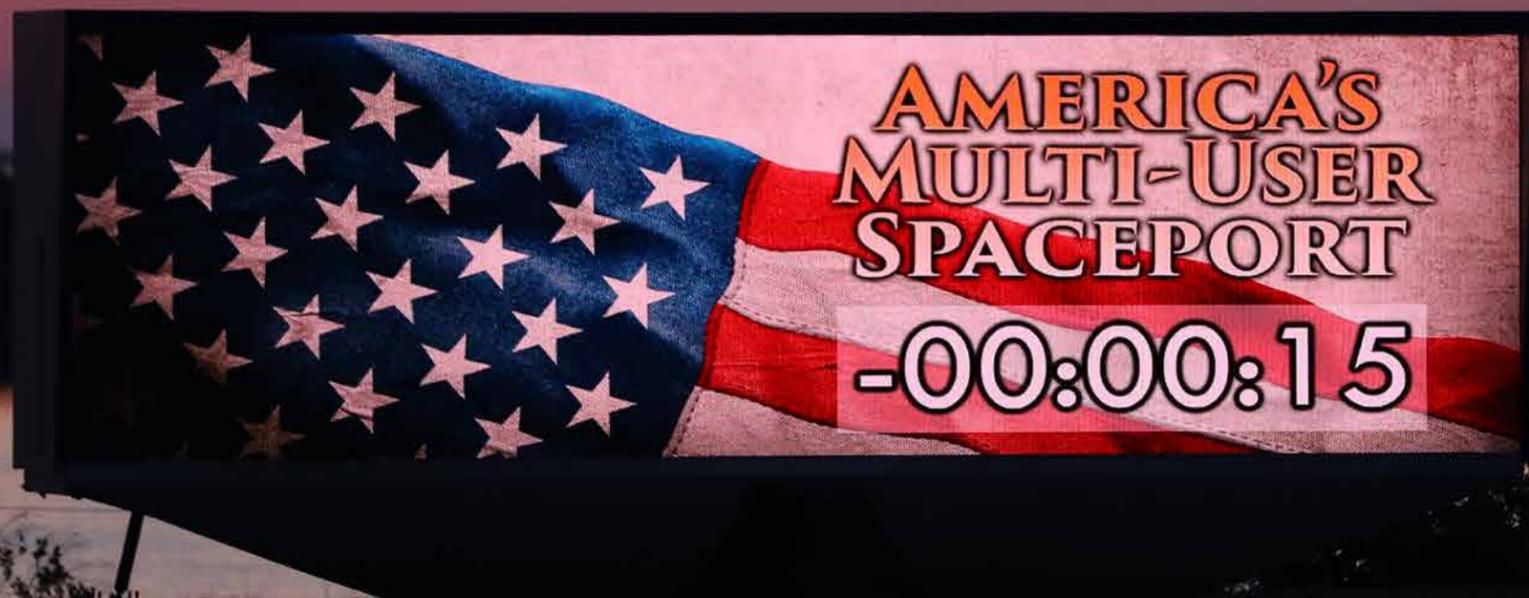
KENNEDY SPACE CENTER

20 | Annual 16 | Sustainability Report



**I LEFT EARTH THREE TIMES AND FOUND
NO OTHER PLACE TO GO. PLEASE TAKE
CARE OF SPACESHIP EARTH.**

– Walter Schirra, NASA Astronaut
Mercury 8, Gemini VI, Apollo 7



Sunrise tints the skies above the Launch Complex 39 turn basin. In the foreground, Kennedy Space Center's iconic countdown clock reminds viewers the center is America's premier multi-user spaceport. In the background at left is Launch Complex 39A, which served both the Apollo and Space Shuttle programs and is used today by SpaceX. Photo credit: NASA/Kim Shiflett

COVER: An adult osprey, carrying a fish in its talons, returns home to its nest atop a speaker platform in the Press Site parking lot. In the background is the NASA logo painted on the side of the Vehicle Assembly Building. Photo credit: NASA/Daniel Casper



Kennedy Space Center
is GO for **GREEN!**



Did you know that Kennedy Space Center provides habitat for more than 1,500 species of plants and animals?

Do your part and help keep their habitat clean.

A gopher tortoise marches down a dirt path bordered by a section of NASA Railroad at Kennedy Space Center. Photo credit: NASA/Bill White

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SUSTAINABILITY SCORECARD

The Sustainability Scorecard provides a quick snapshot of Kennedy Space Center’s performance in meeting the sustainability goals outlined in the KSC Sustainability Plan. It provides a status of functional areas spanning greenhouse gas (GHG) emissions, sustainable buildings, sustainable acquisition, renewable energy, water intensity, fleet management, energy performance contracting, waste management, electronic stewardship and climate change resilience. The KSC Environmental Management Branch monitors the performance in each of these categories to achieve a “Go for Green” status and to identify opportunities for improvement.

Greenhouse Gas Emission Reduction

GOAL: Reduce Scope 1 & 2 GHG emissions by 22.4% compared to an FY 2008 baseline. These emissions pertain to sources owned or controlled by the government (e.g. government fleet, stationary sources) and purchased electricity, heat or steam.

Reduce Scope 3 GHG emissions by 15.2% compared to a FY 2008 baseline. These emissions pertain to activities not directly controlled by the government such as emissions from non-government vehicles (e.g. employee travel, commuting.)

- **Red** Did not meet either target
- **Yellow** Meets one of the two targets
- **Green** Meets both targets

SCORE: ● *Scope 1 & 2 reduced by 54%, Scope 3 reduced by 32%.*

Sustainable Buildings

GOAL: Meet the following targets: 1) reduce energy intensity in KSC goal-subject (GS) facilities by 2.5% annually, compared to an FY 2015 baseline; 2) identify strategies to evaluate existing buildings for future compliance to the revised Guiding Principles, and achieving energy, waste or water net-zero status in GS facilities; 3) identify strategies to evaluate new building designs for incorporation of climate-resilient design elements; 4) identify strategies to meter and monitor data-center energy use.

- **Red** Meets fewer than two targets
- **Yellow** Meets two of the four targets
- **Green** Meets all four targets

SCORE: ● *KSC met three of the four targets. Did not meet energy intensity target since usage increased by 3.7%. *See page 10.*

Sustainable Acquisition

GOAL: Complete the following tasks: 1) educate and train 100% of KSC purchase requisitioners regarding the use of bio-based/bio-preferred products; 2) help rewrite NASA’s Sustainable Acquisition document (NPR 8530.1B); 3) rewrite NASA Form 1707 to be KSC-specific; 4) verify at least 95% of new applicable contracts include clauses for purchasing sustainable products and services.

- **Red** Complete fewer than two tasks
- **Yellow** Complete at least two of the tasks
- **Green** Complete all four tasks

SCORE: ● *All objectives met.*

Renewable Energy

GOAL: Have at least 10% of KSC’s electricity consumption come from renewable sources. These sources include renewable energy generated and used on KSC, renewable energy generated on KSC but used off-site, and the purchase of renewable energy certificates from non-KSC sources.

- **Red** Use less than 7% of electricity from renewable sources as compared to an FY 2015 baseline
- **Yellow** Use at least 7% but less than 10% of electricity from renewable sources as compared to an FY 2015 baseline
- **Green** Use at least 10% of electricity from renewable sources as compared to an FY 2015 baseline

SCORE: ● *More than 16.5% of KSC’s electricity consumption came from renewable sources.*

Water Intensity

GOAL: Reduce KSC’s water intensity by at least 18% as compared to a FY 2007 baseline.

- **Red** Reduce water intensity by less than 16%
- **Yellow** Reduce water intensity by at least 16% but less than 18%
- **Green** Reduce water intensity by at least 18%

SCORE: ● *KSC’s water intensity was reduced by 26.4%.*

Fleet Management

GOAL: Meet the following targets: 1) reduce KSC’s fleet per mile GHG emissions by 2% as compared to an FY 2014 baseline; 2) ensure purchased or leased vehicle acquisitions are at least 75% EPA Act Alternate Fuel Vehicles.

- **Red** Did not meet either target
- **Yellow** Meet one of the two targets
- **Green** Meet both targets

SCORE: ● *KSC purchased and leased vehicle acquisitions were 100% EPA Act Alternate Fuel Vehicles. However, due to efforts to rightsize KSC’s fleet, KSC did not obtain enough of them to reduce fleet emissions by 2%.*

KSC PRIORITY MANAGEMENT PLANS

Metric Description: KSC establishes high priority environmental aspects (which can span multiple years) that require a Priority Management Plan (PMP).

The goals for each FY16 high priority aspect are listed in the metric below. These goals are reviewed and evaluated quarterly and given a score of Green, Yellow or Red. Green indicates the goal has been met. Yellow indicates that there is a possible chance of not meeting the goal and requires the owner of the goal to further monitor or make adjustments on the PMPs. Red signifies that the goal has not been met for the fiscal year and requires the owner of the goal to provide an explanation for not meeting the goal and any corrective actions to be implemented.

Energy Performance Contracts

GOAL: Initiate at least two energy performance contracts. Performance contracting allows the government to partner with private industry on energy and water conservation projects and pay for them with the resulting cost savings.

- **Red** No energy performance contracts initiated
- **Yellow** Initiate only one energy performance contract
- **Green** Initiate two energy performance contracts

SCORE: ● KSC initiated two performance contracts.

Pollution Prevention and Waste Management

GOAL: Meet the following targets: 1) divert at least 50% of non-hazardous, non-Construction and Demolition (C&D) solid waste; 2) divert at least 50% of C&D waste.

- **Red** Did not meet either target
- **Yellow** Meet one of the two targets
- **Green** Meet both targets

SCORE: ● KSC diverted 84% of non-C&D solid waste and 72% of C&D waste.

Electronic Stewardship

GOAL: Complete the following tasks: 1) ensure procurement preferences for environmentally sustainable electronic products; 2) implement policies to set defaults for power management, duplex printing and other energy-efficient features or environmentally sustainable practices on all eligible government electronic products; 3) use environmentally sound practices for disposition of excess or surplus electronic products.

- **Red** Complete only one task
- **Yellow** Complete two of three tasks
- **Green** Complete all three tasks

SCORE: ● All objectives met.

Climate Change Resilience

GOAL: Meet the objective of the Climate Adaption Science Investigation (CASI), which was a multi-year project that included performing a number of tasks annually. The tasks involved collecting data and developing tools that will continue to help ascertain potential sea level rise impacts to KSC's infrastructure and operational capabilities through 2050.

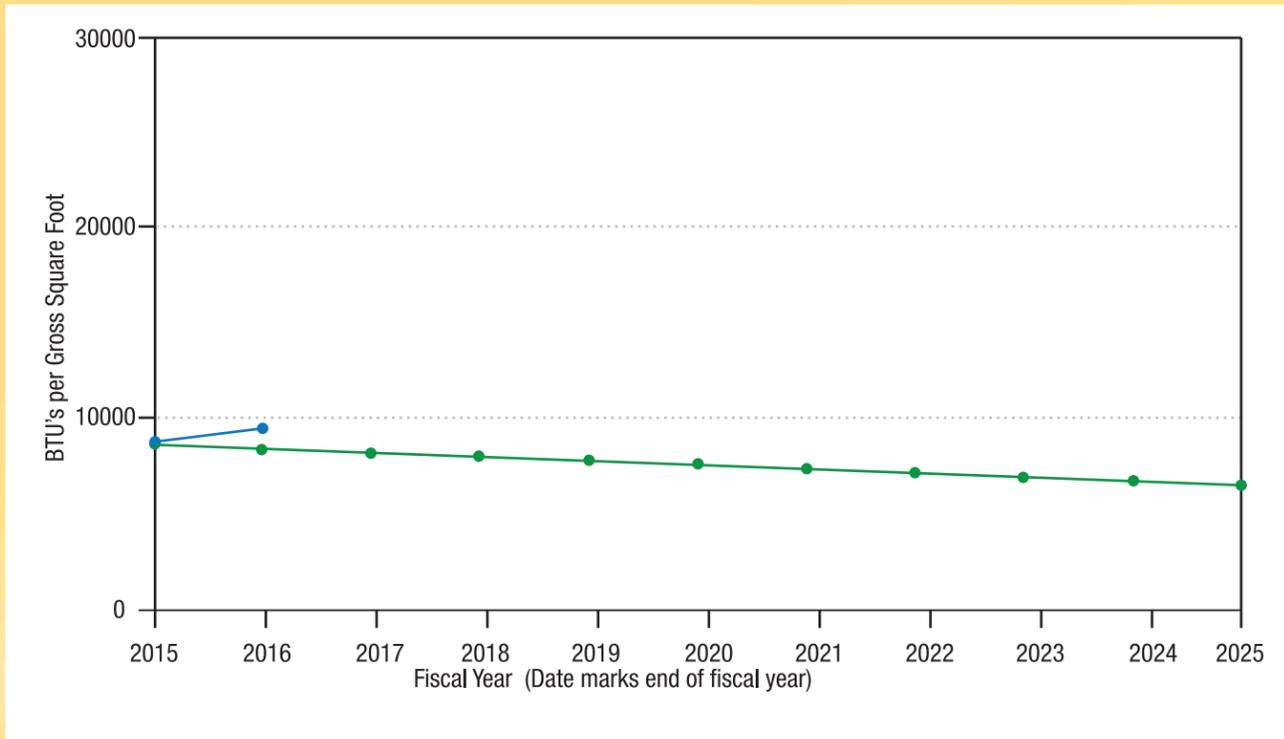
- **Red** Complete less than 80% of the annual tasks listed
- **Yellow** Complete from 80% to 90% of the annual tasks listed
- **Green** Complete more than 90% of the annual tasks listed in the Climate Adaptation Science Investigation (CASI) participation plan

SCORE: ● Met the goal of completing more than 90% of the annual tasks listed.

Status	Goals	Priority Management Plan (PMP) Tasks
●	Energy and Water Consumption - Energy Efficiency (EMS-R-3282): <ol style="list-style-type: none"> Reduce energy intensity by 2.5% from FY15 baseline by 09/30/16 Meet 10% renewable energy use goal from renewable energy sources by 09/30/16 Audit 25% of facility infrastructure for energy saving opportunities by 09/30/16 	<ol style="list-style-type: none"> Keep KSC organizations participating in monthly Energy Working Group meetings Identify energy conservation measures to pursue energy projects Generate proposals for possible CECR funding Promote energy awareness directed to the KSC workforce KSC designs sustainable and energy efficient facilities Identify and prioritize 3+ wind power leading candidate systems for KSC wind environment Develop priority listing for FY16 facility audits (03/31/16) Complete FY16 facility audits evaluations (09/30/16) Understand and start to develop a UESC or ESPC based on ECMs (09/30/16) Develop AUDRIS to provide user-friendly interface for energy and increase usage
●	Sustainable Acquisition – Green Purchasing (EMS-R-3290): <ol style="list-style-type: none"> Implement actions to achieve at least 95% compliance with the BioPreferred and biobased purchasing requirements in EO 13693 	<ol style="list-style-type: none"> Participate in the rewrite of NPR 8530.1A Contact NASA HQ Procurement Office monthly on the status of FAR changes Provide Purchase Requisitioner training to KSC designated requisitioners OP-AM to provide semi-annual Compliance Review report to SI-E3 for analysis Derive a process to validate waiver requirements

ENERGY METRICS

KSC Energy Intensity Metric



Blue line = actual, Green line = goal (below the line exceeds the goal).

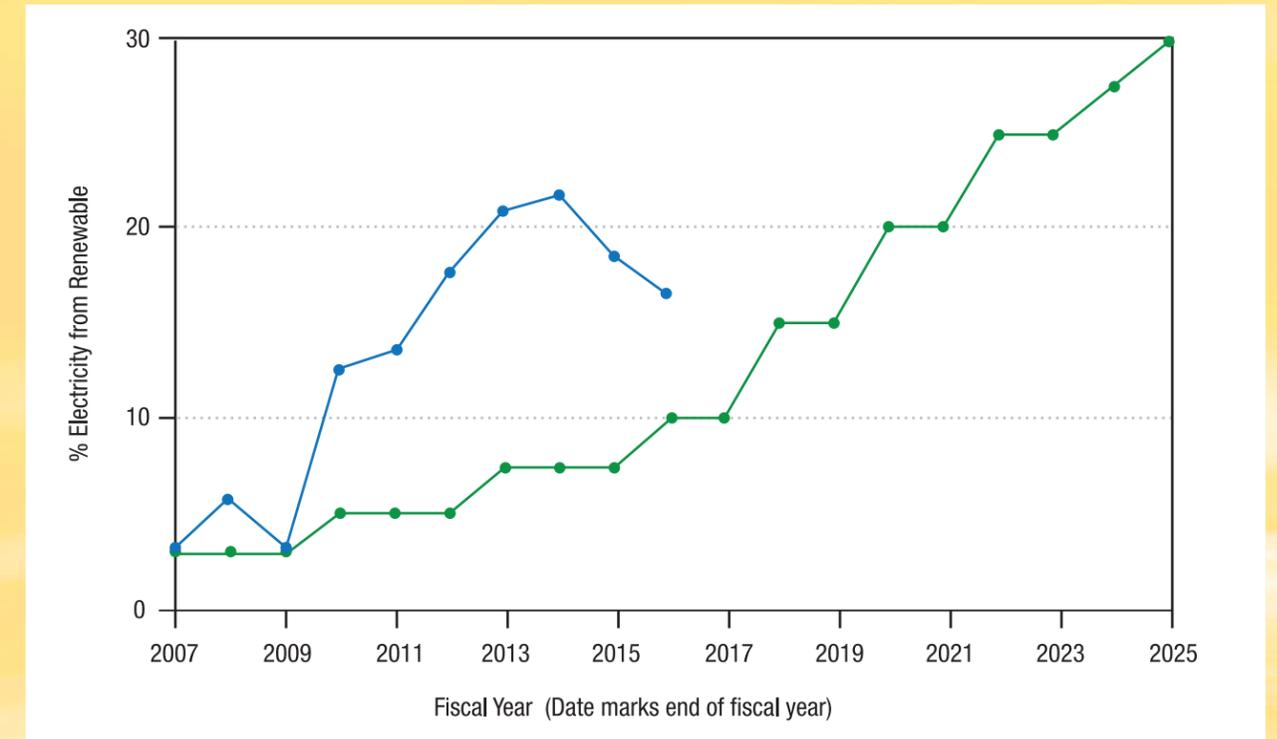
Metric Description: Measures energy consumed in BTUs per gross square foot at KSC's Goal Subject facilities.

Goal: Reduce energy intensity by 2.5% from FY15 baseline by 09/30/16.

Actual: The center's actual energy intensity values; KSC increased its energy intensity by 3.7%.

*Some contributing factors for the energy intensity increase are finite in duration such as constructing phase one of the Central Campus facility and installing new VAB platforms. Central Campus phase one will ultimately be net zero for energy as a result of the new 1.5 MW solar farm under construction. Additionally, we are developing Utility Energy Service Contracts as a means to implement previously identified energy conservation measures throughout KSC.

KSC Renewable Energy Summary



Blue line = actual, Green line = goal (above the line exceeds the goal).

Metric Description: Measures KSC's renewable energy landscape.

Goal: Have at least 10% of KSC's electricity consumption be from renewable sources (see page 7 for more information).

Status: Renewable energy credits received by KSC surpassed the goal.

SEA AWARD WINNERS EXEMPLIFY SUCCESS IN SUSTAINABILITY

Kennedy's Environmental Management Branch developed the Sustainable Environment Awareness (SEA) Award in order to recognize exemplary achievement that advances sustainability at the spaceport. Environmental committee members vote on nominations and approve the awards, carefully assessing each nomination using a variety of criteria such as innovation, impact to NASA's mission, outreach, teamwork and more. The award itself emphasizes a dedication to reusing and recycling. Its design incorporates plate glass that came from windows in Kennedy's Launch Control Center firing

rooms. Launch controllers and managers watched through these very windows as vehicles such as the Apollo/Saturn V and the space shuttle thundered into space. The windows were a permanent fixture in the LCC from 1963 until they were replaced in 2010.

There are 11 award categories: Greenhouse Gas Emission Reduction, Sustainable Buildings, Clean and Renewable Energy, Water Management, Fleet Management, Sustainable Acquisition, Pollution Prevention and Waste Reduction, Energy Performance Contracts, Electronic Stewardship, Climate Change Resilience and Tactical Support.

The SEA award design incorporates plate glass that came from windows in Kennedy's Launch Control Center firing rooms. These windows were a permanent fixture in the LCC Facility from 1963 until they were replaced in 2010.
Photo credit: NASA/Cory Huston

Opposite: Workers in Firing Room 4 of the Launch Control Center take advantage of the view as space shuttle Discovery lifts off on mission STS-121.
Photo credit: NASA/Kim Shiflett



SEA AWARDEES FISCAL YEAR 2016

Ground Processing Corrosion Preventive Compounds Team

Luz Marina Calle, Ph.D. and team for the implementation of environmentally friendly corrosion preventive compounds into KSC ground processing use.

Team members: *Dr. Eliza Montgomery, Teresa Lawhorn, Bill Simmonds, Marian Poulin, Lisa Huddleston, Dr. Mark Kolody, Jerome Curran and Teddy Back*

Delaware North Companies Parks & Resorts at KSC Inc., Solar Generator Team

Rob Jones and team for eliminating the use of diesel generators—thereby reducing the emissions of greenhouse gases—by purchasing a portable solar generator to provide power for parking attendants' booths.

Team members: *Tom Steiner, Terry Huckabee and Rodney Stratton*

Landfill Cover Team

Derick Fowler and team for pollution prevention and greenhouse gas emissions reduction by using roadside ditch soils as an alternative to borrow pit soils for providing landfill cover, restoring roadside shoulders, and backfilling areas cleared of non-native trees.

Team members: *Rodney Brown, Michael England, Frederick Holstein, Frederick Harrell, Kenny Mitchell, Timothy Slaughter, Randall Shocklee, Randy Trexler, Eugene Peeples, Mack Lane, Rodney Manning, Scott Smith, Jeff McDowell, Ryan Ostarly, Ron Traylor and Eryln Hupfer*

Delaware North Companies Parks & Resorts at KSC Inc., Car Charging Station Team

Edwin Morales and team for demonstrating NASA's and Delaware North's commitment to reducing greenhouse gas emissions by supporting the use of alternative fuel vehicles with the installation of three electric vehicle charging stations at the Kennedy Space Center Visitor Complex.

Team member: *Gina Parrish*

Kennedy Space Center Sustainability Report Team

Greg Harland and team for totally revamping the 2015 KSC Annual Sustainability Report to better highlight the great accomplishments of the sustainability and environmental teams throughout the year.

Team members: *Anna Heiney and Greg Lee*

ACROSS KENNEDY

Launch Equipment Shop Receives HVAC Upgrades

The Launch Equipment Shop is in the process of being upgraded with modernized heating, ventilation and air conditioning (HVAC) equipment. These enhancements are aimed at increasing the energy efficiency of the facility, which is located in Kennedy's Launch Complex 39 area. The project entails reconfiguring the shop's air handlers, boilers, controls and other HVAC components, and adds two new mechanical rooms to house the new equipment. Additional upgrades include the replacement of controls and electrical components associated with the HVAC system. Work began in January 2016 and is slated to continue until summer of 2017.

Central Campus Solar Plant Add-on

Kennedy is expanding its solar capability. In November 2015, the center awarded a contract for the construction of an additional photovoltaic facility near the existing 1 MW solar farm. This new solar farm will add approximately 1.5 MW of photovoltaic power that, when combined with the existing 1 MW facility, will more than offset the expected energy consumption of the first phase of Kennedy's new Central Campus -- giving it a "net zero energy" qualification toward LEED certification.

The project is in progress, as the construction area has been graded and several old wells on the site have been capped. Work is expected to be complete in February 2018.



This solar field provides power to Kennedy's Industrial Area. The facility's expansion, at left, will allow it to generate enough energy to meet the needs of the first phase of Central Campus construction. Photo credit: NASA/Gregory B. Harland

An aerial view of the Contractor Road and Launch Complex 39 areas at NASA's Kennedy Space Center. Photo credit: NASA/Kim Shiflett

THE BIG CHILL

Thermal Energy Storage System Chills Kennedy's Electric Bill

A gigantic water tank recently completed at Kennedy will serve, in a way, as a battery backup for the center resulting in lower energy bills. It has already produced a \$1.5 million rebate from Florida Power & Light. Filled with 2.8 million gallons of cooled water, the 80-foot-tall, 78-foot-diameter tank is designed to collect and store thermal energy for later use. The tank is heavily insulated and includes mechanisms to diffuse heat to prevent the water from heating up beyond the 40-degree mark. The process works by chilling the water overnight when it's the coolest outside and electricity is cheapest, then releasing it during the hottest part of the day to cool equipment. The approach is projected to save \$260,000 to \$330,000 a year in electrical costs at the center. The project is expected to pay for itself in 12 to 14 years through cost savings.

"We were attracted to this approach because a great deal of our electricity here at Kennedy goes to cooling all the machinery we have out here," said Ismael H. Otero, Kennedy's project manager on the thermal energy program. "Using this method, our facilities' cooling needs can be met with minimal electricity during peak hours."

Scott Hunt, a NASA mechanical engineer, proposed using this technology on an industrial scale at Kennedy in order to help the center meet goals for sustainable energy systems.

As for the rebate from Florida Power & Light, Kennedy teams are looking for

the best ways to use it. Rules call for such rebates to be used for conservation measures. With plenty of projects to choose from, the choice largely comes down to benefit and how long it would take for the energy savings to pay back the cost, said Dan Clark, Sustainability Team Lead at Kennedy.

"There are lots of things we can do to save energy, but we have to look at the best use of taxpayer funds and pursue the work that will make the most benefit," Clark said. At the top of the list is replacing many of Kennedy's external lights with amber LED lights, work that has already begun on a small scale. LEDs use much less energy than current lights, and the amber wavelength of the LEDs is invisible to sea turtles. That's important because sea turtles can get disoriented quickly by regular outdoor lights and be led away from the ocean they are trying get to, leaving them stranded on shore.

Other potential projects include upgrading office lights with LED lighting, and replacing select stairwell lighting with LEDs and motion sensors that dim stairwell lights when nobody is present. Plans also are being made for light-sensitive sensors, heating and air conditioning improvements and looking closely at emerging energy technologies.

The thermal energy project ultimately is saving taxpayer dollars with a lower utility bill. It also is improving the resilience of Kennedy's infrastructure to catastrophic events.



Ismael H. Otero, NASA Kennedy Space Center's project manager on the thermal energy program, addresses the news media and NASA Social about the new Thermal Energy Storage tank Feb. 17. The TES tank works like a giant battery and is saving the center utility costs. These savings will be applied to new sustainable projects at Kennedy. Photo credit: NASA/Cory Hulston

GOOD HOUSEKEEPING

Newly Developed Cleaning Methods Earn GreenGov Presidential Award



Members of Kennedy's Chemistry Team meet with Christine Harada, Associate Administrator of Government-wide Policy at the General Services Administration, during her visit to Kennedy for the launch of Orbital ATK CRS-4. Photo credit: NASA

Innovations in precision cleaning developed at Kennedy have earned the spaceport's Chemistry Team a GreenGov Presidential Award.

The project features two novel methods of removing contamination from hardware without traditional solvents, maintaining the same critical level of effectiveness while avoiding environmentally damaging effects. With these innovations, NASA is investing in the future by improving its own capabilities and aiding industry, while taking steps to protect the Earth.

"In following the President's call to lead by example, the Kennedy Space Center's Chemistry Team set out to develop precision cleaning methods that, while maintaining equal performance and cost parity, would not have any environmental liability; and they met that challenge," the

award reads.

GreenGov Presidential Awards honor federal teams, programs or projects that answer the call for a clean energy economy. Principal investigators Kathleen Loftin and Paul Hintze received the award on behalf of Kennedy's Chemistry Team during a ceremony Nov. 30, 2015, in the Eisenhower Room at the White House.

"In the Environmental community, this is a big deal," said Annie Williams, Kennedy's Environmental Award Program coordinator. "It's really a prestigious award."

In the past, Loftin explained, each solvent used by NASA and industry had been considered benign—until it turned out to be harmful. Researchers with NASA and Kennedy's Engineering Services Contract teamed up to find a way to break this cycle.



Kennedy Space Center's Chemistry Team is awarded the GreenGov Presidential Award on Nov. 30 in Washington, D.C. From left are Dr. Paul Hintze; Christy Goldfuss, managing director, White House Council on Environmental Quality; Dr. Kathleen Loftin; and Calvin F. Williams, NASA assistant administrator for Strategic Infrastructure. Credit: NASA

"We said, 'Let's not think about something to use for 10 years, until we find out what's wrong with it. Let's look at whole new ways of cleaning.'"

In its quest to develop environmentally friendly precision cleaning methods, the team ultimately developed two different processes that can clean space hardware components without any liquid solvents.

The Supercritical Fluid Extraction method uses carbon dioxide, compressing and heating it to the point at which it becomes a supercritical fluid, which has properties of both liquids and gas. In that state, the compressed carbon dioxide ultimately works just like a chemical compound. The compressor requires a small amount of power, but there is no net carbon footprint, and the carbon dioxide can be recycled and reused. The only byproduct, Loftin said, is the dirt that remains when cleaning is complete.

In the plasma cleaning method, the part to be cleaned is

placed inside a chamber of air. When subjected to high energy levels, the gas converts to a plasma, which reacts to the part's surfaces and knocks away contaminants and other impurities.

"Both methods have been around for a while, but not in this application," Loftin explained. "It's a new way of cleaning that people hadn't thought of before."

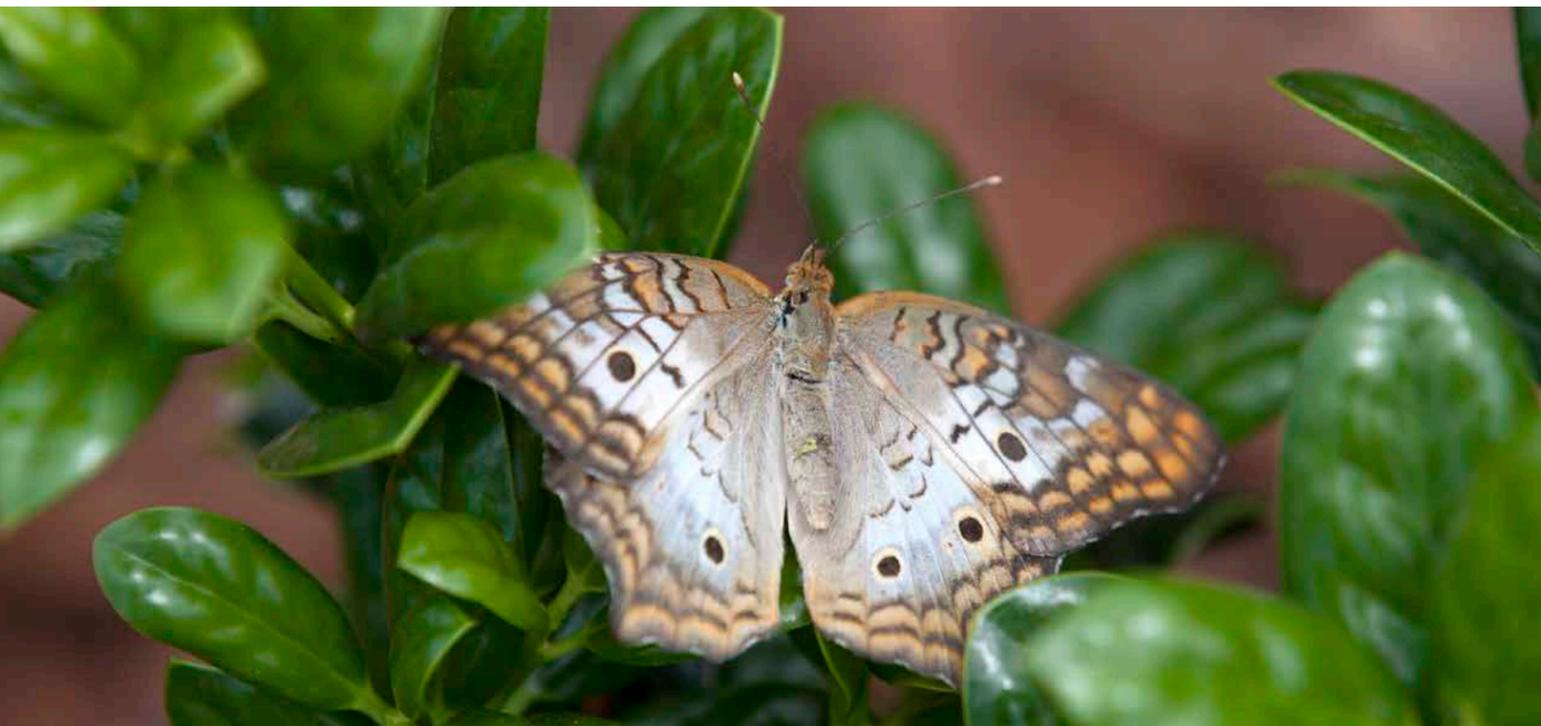
NASA is not the only organization that stands to benefit from these innovations. Industries such as aerospace, electronics and even dry cleaning rely on precision cleaning.

"It's amazing to see that we could have an impact outside NASA," Loftin said.

"Our belief is that if you can do something in the right way, and in a sustainable way, you can save money and help the environment."

EARTH DAY 2016

Sustainability Takes Center Stage



There's no place like home.

That was the prevailing attitude on April 21-22 as Kennedy marked the 46th annual Earth Day with a two-day celebration designed to spread awareness of our planet's needs—and to share innovations that can contribute to sustainable living both at work and at home.

For more than four decades, NASA has been using the vantage point of space to increase our understanding of Earth and safeguard our future while improving lives. "At NASA, it's Earth Day every day as 20 missions continuously orbit the planet to study climate change, the behavior of oceans, precipitation worldwide, and many other Earth vital signs that help us become better stewards of our home," NASA Administrator Charles Bolden said in a statement to employees.

This year's Earth Day expo showcased demonstrations and products by exhibitors from across the country in order to get people thinking about changes they can make in order

to preserve our planet and its limited resources.

The event kicked off in Kennedy's Space Station Processing Facility on April 21, then moved to the Kennedy Space Center Visitor Complex on April 22, allowing employees and visitors to learn and benefit from the array of available activities.

More than a dozen electric cars were on display from a variety of automakers. Some were available for test drives, and many participants took advantage of the opportunity to try out the vehicles.

Several exhibitors shared technologies and tips for saving energy and water in the workplace, the home and throughout the community through water treatment, recycling and lighting controls, among others. Guests also had the opportunity to see a variety of green, biobased and recycled products, and learn about their origins and advantages.



Florida's natural environment also played a starring role, with wildlife and conservation specialists such as the Brevard Zoo and Merritt Island National Wildlife Refuge on hand to discuss methods to safeguard wildlife, preserve natural resources, and protect Florida waters.

NASA Biological Intern Taylor Pitcock of Kennedy's Environmental Management branch held an Eastern corn snake, allowing guests to see and touch the non-venomous reptile. "It's always a good time to see kids' reactions, hear the questions they ask, and watch the excitement on their faces when they get to hold a snake," Pitcock said.

Master gardeners and pollinator specialists offered their expertise and answered questions, and native butterflies were released throughout

the day at the visitor complex on Friday. Visitors gathered in the complex's Rocket Garden to help open small envelopes to free the butterflies. Some of the creatures immediately fluttered above the crowd while others gingerly tested their wings before flying away.

NASA's sustainability policy is to execute NASA's mission without compromising our planet's resources so that future generations can meet their needs. Sustainability also involves taking action now to provide a future where the environment and living conditions are protected and improved.

"Every day is Earth Day," Pitcock said. "Everybody can do their own part. No action is too small."

Did you know? In 2016, KSC recycled 217 tons of paper. That equals a savings of:

- 3,689 trees
- 82,460 gallons of oil
- 651 cubic yards of landfill space
- 868,000 kilowatts of energy
- 2,219,000 gallons of water

TAKING THE LEED

New, Efficient Data Center Earns LEED Silver Certification

When Kennedy officials began planning for a modern data center, they decided from the very beginning they wanted the new facility to meet stringent standards for sustainability and environmental performance.

On Aug. 29, 2016, those extra efforts paid off when the Kennedy Data Center (KDC) was awarded LEED Silver Certification by the U.S. Green Building Council. “This achievement was very important to Kennedy Space Center and especially to the KDC team after more than three years of planning, design and construction to bring the facility all the way up to fully operational,” said NASA’s David Sumner, who served as the data center’s facility project manager throughout its design and construction.

LEED stands for Leadership in Energy and Environmental Design. It’s a widely used rating system through which buildings, campuses and even entire communities can be ranked according to factors such as sustainability, water and energy efficiency, greenhouse gas emissions and many more. The four available rating levels are Certified, Silver, Gold and Platinum.

“We strive in all new and renovated facilities to achieve at least a LEED Silver rating,” Sumner explained.

Opened in October 2015, the Kennedy Data Center is a key element in the spaceport’s IT infrastructure. Within its 16,000 square feet, it consolidates computing and data handling capability that previously required five separate data centers totaling about 45,000 square feet. The new facility was built to increase reliability while reducing square footage, energy costs, and operations and maintenance costs. Ensuring the new data center would meet the

requirements for LEED Silver certification wasn’t easy. “The data center has a very specific purpose, with high power consumption and low personnel usage per square foot of facility, especially compared to a standard office building—and this made LEED certification more challenging to achieve,” Sumner explained.

The team succeeded by starting early. Regional materials and recycled content were used whenever possible. The finished data center boasts optimized energy performance, reduction in water use through low-flow plumbing fixtures and natural irrigation, a sustainable site design and other innovations, such as “green” housekeeping and pest management.

The team also enlisted the help of LEED-accredited sustainability consultant EXP, which developed, submitted, coordinated and completed the LEED certification documentation required by the U.S. Green Building Council.

The Kennedy Data Center is part of the first phase of the Central Campus currently in development in the heart of the spaceport’s Industrial Area. A new seven-story, 200,000-square-foot headquarters building, already under construction, will anchor the Central Campus and provide office space for about 500 employees. Like the data center, it is designed with sustainability and efficiency in mind.

“After the excitement of completing the KDC construction and having it prove operational, receiving the LEED silver certification was very rewarding,” Sumner said. “It further proves our team built a highly technical, special-operations facility while still maintaining sustainable environmental protection and energy reduction.”

Did you know? The KSC Data Center Consolidation Project activity was able to close two inefficient data centers located in the Space Station Processing Facility and the Central Instrumentation Facility during fiscal year 2016. The IT infrastructure that was housed in those two data centers now resides in the Kennedy Data Center. With moves in 2016, KSC has seen a savings in IT power and cooling efficiency and saved 1,596.072 kilowatt hours.



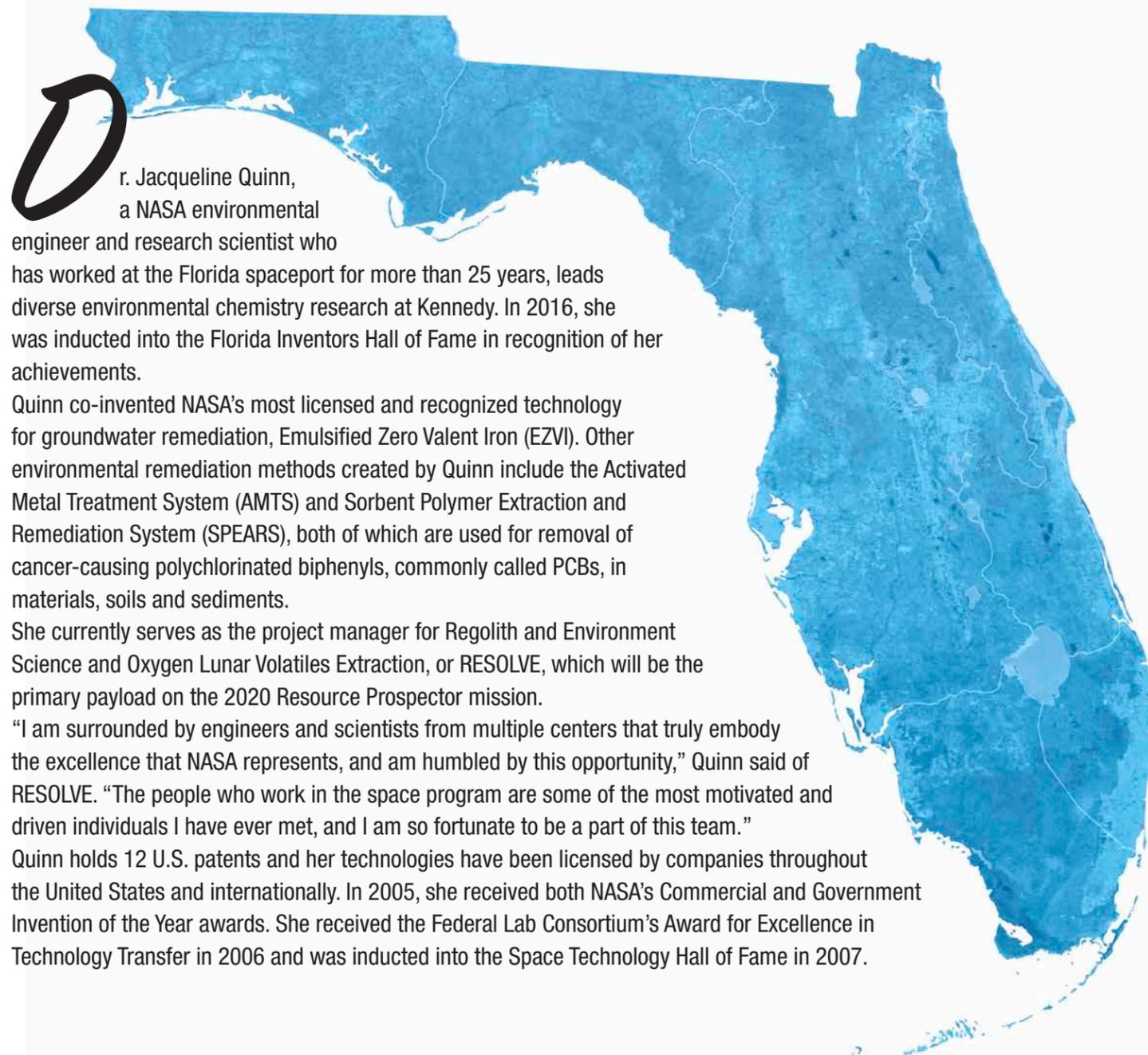
The Kennedy Data Center opened in October 2015. By consolidating multiple data centers into a single new one, Kennedy streamlined IT operations and improved efficiency. Credit: NASA



The northwest view is seen in this artist concept of the new Kennedy Space Center Headquarters Building now under construction. Credit: NASA

Hall of Famer

Quinn Named to Florida Inventors Hall of Fame



Dr. Jacqueline Quinn, a NASA environmental engineer and research scientist who has worked at the Florida spaceport for more than 25 years, leads diverse environmental chemistry research at Kennedy. In 2016, she was inducted into the Florida Inventors Hall of Fame in recognition of her achievements.

Quinn co-invented NASA's most licensed and recognized technology for groundwater remediation, Emulsified Zero Valent Iron (EZVI). Other environmental remediation methods created by Quinn include the Activated Metal Treatment System (AMTS) and Sorbent Polymer Extraction and Remediation System (SPEARS), both of which are used for removal of cancer-causing polychlorinated biphenyls, commonly called PCBs, in materials, soils and sediments.

She currently serves as the project manager for Regolith and Environment Science and Oxygen Lunar Volatiles Extraction, or RESOLVE, which will be the primary payload on the 2020 Resource Prospector mission.

"I am surrounded by engineers and scientists from multiple centers that truly embody the excellence that NASA represents, and am humbled by this opportunity," Quinn said of RESOLVE. "The people who work in the space program are some of the most motivated and driven individuals I have ever met, and I am so fortunate to be a part of this team."

Quinn holds 12 U.S. patents and her technologies have been licensed by companies throughout the United States and internationally. In 2005, she received both NASA's Commercial and Government Invention of the Year awards. She received the Federal Lab Consortium's Award for Excellence in Technology Transfer in 2006 and was inducted into the Space Technology Hall of Fame in 2007.



Dr. Jacqueline Quinn with the Sorbent Polymer Extraction and Remediation System, or SPEAR

AMERICA RECYCLES DAY



Kennedy Space Center Employees Support America Recycles Day

Kennedy partnered with Keep America Beautiful and Goodwill Industries to participate in America Recycles Day on Nov. 9 and 10, 2015. The national emphasis focuses on opportunities not to discard items that can be recycled, giving them new life.

The center's Spaceport Integration and Services Directorate encouraged employees to bring in personal electronic waste, either working or not, as well as new and "gently used" household articles. These items were collected by Goodwill Industries for reuse.

Altogether, 182 people dropped off more than 7,500 pounds of items to be recycled.

America Recycles Day is a program of Keep America Beautiful and is nationally recognized as a time dedicated to promoting and celebrating recycling in the U.S. Every

year on or around Nov. 15, event organizers work to educate neighbors, friends and colleagues about the value of not discarding no-longer-needed items.

According to the website of Keep America Beautiful, the national recycling rate has increased annually for the past 30 years. The current recycling rate in the U.S. is 34.5 percent.

During the two-day event, scores of Kennedy employees turned in goods to be recycled, dropping them off in the parking lots of the Kennedy Learning Institute and Vehicle Assembly Building. While some of the materials turned in were used household items, much of it was electronic waste.

The U.S. Environmental Protection Agency (EPA) reports that electronic products are made from valuable resources

and materials, including metals, plastics and glass, all of which require energy to mine or manufacture. Donating or recycling consumer electronics conserves our natural resources and avoids air and water pollution, as well as greenhouse gas emissions that are caused by manufacturing.

Noting the value of recycling electronics, the EPA reports that recycling one million laptop computers saves the energy equivalent to the electricity used annually by more than 3,500 U.S. homes. For every million cell phones recycled, 35,000 pounds of copper, 772 pounds of silver, 75 pounds of gold and 33 pounds of palladium can be recovered.

Established in 1953, Keep America Beautiful provides the expertise, programs and resources to help people

end littering, increase recycling and beautify America's communities. Among the organization's most effective efforts was their 1971 ad campaign discouraging litter. During the 1950s and 1960s, roadside trash was commonplace.

The public service announcement came to be known as the "Crying Indian ad." Narrated by actor William Conrad, the message featured actor Iron Eyes Cody portraying a Native American saddened to see the damage to the Earth's natural beauty by the thoughtless litter. A short promotional video for Kennedy employees recently was produced encouraging everyone to avoid throwing recyclable waste into an ordinary trash can, choosing a recycling bin instead.

John Ryan, left, and Adrienne Valek of Goodwill Industries load electronic equipment for recycling. Kennedy Space Center employees turned in no longer needed household items as part of America Recycles Day. The national emphasis focuses on opportunities not to discard items that can be recycled, giving them new life and protecting the environment. Credit: NASA/Ben Smegelsky

FEEL THE BURN



Agreement Makes Prescribed Burns Easier to Schedule

Prescribed burns play a pivotal role in maintaining lands on the Merritt Island National Wildlife Refuge. Because the refuge shares borders with Kennedy Space Center, coordinating prescribed burns has always been a careful balance between locations, conditions and activities taking place near proposed burn sites.

The U.S. Fish and Wildlife Service (USFWS) conducts prescribed burns at the refuge for two reasons. The first reduces hazardous fuel loads around Kennedy infrastructure and surrounding communities, thereby reducing the likelihood of a catastrophic wildfire. The second improves or restores wildlife habitats to pre-fire exclusion conditions to promote and benefit threatened and endangered species that are dependent on fire adapted ecosystems.

It wasn't always easy to schedule a prescribed burn. In the past, the decision was based on a USFWS request to do a burn in one of the 29 specific parcels that make up the refuge. Hundreds of officials from both Kennedy and the U.S. Air Force 45th Space Wing had "go/no go" authority—and it only took one "no go" to put a halt to a planned burn.

Prescribed burn is in progress along Wisconsin Village Road just west of Kennedy's Shuttle Landing Facility in 2015. Photo courtesy of U.S. Fish and Wildlife Service

To improve this process, the Prescribed Burn Working Group, a multi-agency group with members from the 45th Space Wing (45 SW) and Kennedy, sat down to negotiate the best way forward. A short list of rules was drawn up and agreed to by all parties. In April 2016, Kennedy, the 45 SW and the USFWS signed a three-year Memorandum of Understanding giving the USFWS more autonomy to conduct prescribed burns on Kennedy.

The Kennedy Customer Services and Integration Branch, part of the center's Spaceport Integration and Services Directorate, plays a key role in this new process. It is their responsibility to coordinate the USFWS's burn requests with the center's Institutional Support Contractor and all the programs and customers that operate at our multi-user spaceport.

The fire crew identifies areas that should be burned under specific conditions, and Kennedy presents burn-sensitive areas during the timeframe identified for burning. The new agreement allows for a better review and assessment for both parties that has resulted in more burns and reduced threat for wildfire.

"Instead of asking permission to burn, we notify when we are going to burn, knowing the standard rules and what restrictions are in place," said Mike Good, a prescribed fire specialist with the USFWS. "The new process allows us to better focus our efforts on the actual prescribed burn implementation."

Before a burn begins, teams must carefully weigh several factors such as weather forecasts, humidity, predicted wind speed and direction, fuel types, topography and time since the last burn. Firefighters who will assist with the prescribed burn attend a safety briefing to discuss the plan and identify what will be done in case the fire moves outside the controlled area or does not meet the needs of the habitat. Finally, a small test burn allows for a field litmus test to make the final determination whether the burn is a "go" or a "no go."

Where smoke-sensitive payload processing or sensitive operations are being conducted, there is a default, two-mile buffer around those facilities or operational areas. However, sensitive payloads being processed in particular facilities may require a larger contamination buffer. To that end, Kennedy's workforce can use a tool called GeoSpatial Integrated Master Schedule, or GeoSIMS, which illustrates daily contamination buffer zones. The new agreement and GeoSIMS visualization tool have helped clear the way toward an efficient, effective prescribed burn process that will support the refuge's environmental needs while reducing the impact on Kennedy operations.



A prescribed burn southeast of the Vehicle Assembly Building sends a large smoke plume into the skies above Kennedy in 2011. Photo courtesy of U.S. Fish and Wildlife Service

SETTING AN EXAMPLE

Kennedy Models Good Practices in Sustainability Case Study

Kennedy Space Center's sustainability efforts stand out as a model. Thanks to the George Washington University in Washington, D.C., some of the spaceport's achievements are highlighted as a case study to help other federal managers learn by example and help achieve the goals set forth in Executive Order 13693, Planning for Sustainability in the Next Decade. The George Washington University (GW) Sustainability Collaborative worked with the White House Council on Environmental Quality to produce a business school-like case study that analyzed exemplary sustainability actions within the federal government.

Led by the GW Executive Director of Sustainability and representatives of GreenGov, the council not only requested that Kennedy participate, but chose to produce the first case study at the spaceport, showcasing the center's achievements in the use of biobased products.

The case study focused on a wide range of biobased products used at a variety of Kennedy facilities and the Kennedy Space Center Visitor Complex. Such products include cleansers, high-temperature grease lubricants, FR3 fluid in electrical transformers, coolants and biobased-backed carpet, among other available biobased technologies.

Additionally, the study highlights Kennedy's use of the NASA Environmental Tracking System to report biobased purchasing, the center's training on biobased purchasing requirements, and collaboration and communication with spaceport contractors and within the purchasing community.

George Washington University provided Kennedy with a copy of the case study, which also featured center employees who participated in video interviews.

The case study was formally presented at the GreenGov awards ceremony held Nov. 30, 2015, in Washington, D.C.

Did you know that in FY16 KSC recycled approximately 501,500 plastic bottles and approximately 304,840 aluminum cans, which saves enough energy to run a laptop for 180 years? Your bottles and cans count!

Matt McCormick, a crane, door and platform technician with Engineering Research and Consulting, Inc., applies biobased lubricant to the Vehicle Assembly Building High Bay 3 vertical door counterweight rail. Photo credit: ERC-TOSC





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Expedition 50 Flight Engineer Thomas Pesquet of the European Space Agency photographed the Rocky Mountains from his vantage point in low Earth orbit aboard the International Space Station. He shared the image with his social media followers on Jan. 9, 2017, writing, “the Rocky mountains are a step too high – even for the clouds to cross.”